Alberta Health
Claims Redevelopment Project
Claims Assessment System (CLASS)

Medilink Pilot Project
Evaluation Report

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1.0 EXECUTIVE SUMMARY

The Medilink Pilot Project was an undertaking of Alberta Health, in conjunction with the Alberta Medical Association and the Independent Physical Therapists of Alberta. The purpose was to assess the feasibility of the most practical and cost-effective alternatives for the electronic submission of claims and eligibility checks from the computing facilities in practitioner offices to databases of Alberta Health information.

The Department issued a request for contracted services to develop software and install a pilot system on November 28, 1988. The successful applicant was VCS Technologies Inc, based in Calgary. In conjunction with Departmental staff, VCS started rolling practitioners on to the pilot in July of 1989, with a completion date of December 31, 1989 for submitting claims.

OVERALL RESPONSE

The Medilink Pilot Project overall has received a very positive response from the parties involved. It has demonstrated that Medilink is a viable alternative for claims submission across the province. The response to the following question on the participant evaluation summarizes Medilink in the simplest way:

> Based on the limited functions the pilot offered, would you recommend that Medilink be developed and offered to all practitioners?

Twenty one out of twenty seven responses recommend future development, with no participants recommending that Medilink be stopped (6 were undecided).

BENEFITS

The benefits to be gained from Medilink were identified as follows:

1. The capability of performing automatic reconciliation in the practitioner office.
2. A reduction in paper requirements.
3. A reduction in the refusal rates of claims submitted through the Medilink process, resulting in a reduced requirement for practitioner and Departmental staff to investigate and correct refusals.
4. Improved claims processing time.
5. Early identification of errors.
6. Potential for accurate correction and resubmission.
7. Reduction in follow-up activities related to refusals, including the inquiry and investigation process.
8. Existing software billing systems are capable of being adapted to electronic submission of claims.

ISSUES

A number of issues were identified for consideration prior to province-wide installation. Some of these are described below:

1. **Exception Claims Handling** - The Department should look at ways of reducing (if not eliminating) exception claims, such as those for out-of-province patients, so they may be handled electronically.

2. **Patient Number** - The lack of a unique number causes problems of tracking and keeping information current, and the requirement to maintain old numbers as well as current ones causes an excessive data storage and maintenance problem on the host mainframes.

3. **Improved Currency of Information** - Information was found to be out of date for a number of activities, and ways of improving the situation should be investigated.

4. **Accreditation** - Accreditation requirements should be defined for private vendor mainframes and software packages used in a Medilink configuration.

5. Limited Technical Evaluation
   - o The market for computer hardware is so large that many alternatives could not be evaluated. Any other hardware required to be used for Medilink would have to be accredited before use.
   - o The variety of geographic locations would have to be verified for telecommunications stability prior to installing Medilink province-wide.
   - o A close appreciation of the areas of technical standards definition was gained, which can be used by the Department to establish comprehensive accreditation standards for electronic communication.

6. **Limited Software Interface Evaluation** - The pilot project used only a few of the many software systems on the market which address practitioner billing requirements. However, no major problems were encountered adapting them to Medilink.

7. **Patient Statement** - this was proved to be technically feasible. However, most participants reported that the function has too great an impact on their office procedures, and only rarely used it.

8. **Improved Accuracy of Information** - The accuracy of extract information used for eligibility checks, and name searches in particular, reduced the effectiveness of the function.

9. **Confidentiality** of extract information remains to be clarified. This relates to the policy providing the information to private sector service bureaux.

COSTS

Information relating to the costs of Medilink were gathered where possible. The costs of installing and supporting Medilink in practitioner offices have been identified, with the qualification that there are so many variables associated with the costing that a single figure becomes meaningless. The telecommunications costs have been identified, but have not been factored in to the mainframe vendor costs.

1. The costs of hardware for Medilink in a single workstation practitioner site are estimated at between **$2,000 and $10,300**, depending on requirements.

2. The installation and monthly charges for telecommunications equipment vary significantly by geographic location, and the type of telecommunications used. For a single trunk with touchtone in Calgary, this could be **$26.86** per month, together with **$45.00** for installation.

3. Transmission costs are estimated at approximately $0.0074 per claim unit (defined as one claim submitted, together with receipt of payment information, and an estimated incidence of eligibility checking, resubmission and telecommunication error). For a practitioner submitting 50 claims per day over a 20-day month, the telecommunications costs would be **$7.40**.

4. The significant costs of setting up, running and maintaining a mainframe computer system to drive a Medilink-type of environment must also be applied. This includes the Departmental costs required to provide extract information and support to Medilink vendors.

CONTEXT

The quality of evaluation information must be placed in context from two perspectives in order to make projections for a province-wide installation. First, only 40 practitioner locations out of over 3,500 were involved, of which 32 submitted an evaluation. 54 practitioners submitted claims through Medilink, with a further 218 utilizing the value-added functions. Second, as can be seen from Table 5 - Participant Rollout, the real volumes of transactions did not start to be transmitted by practitioners until the latter two months of the project.

CONCLUSION

The Medilink pilot project clearly demonstrated a number of potential benefits to be gained by the practitioner, the Department, and the private sector. The opportunity exists for providers of hardware, software and computing services to provide practitioners with the choice to suit the wide variety of requirements. This would result in a viable alternative claims submission environment which is capable of expansion to take advantage of future developments in technology and telecommunications.

2.0 INTRODUCTION

The purpose of this report is to record the results of the Medilink pilot project. The format of this report is as follows:

- Background and Objectives - to put the project into perspective.
- Description of Medilink - to provide a description of Medilink as it was implemented.
- Evaluation - to record the findings of the pilot project, according to the following breakdown:
  - functional;
  - technical;
  - economic.
- Conclusions - to summarize the findings.

APPROACH:

Practitioners were solicited by VCS and the professional associations to adapt their office procedures for the duration of the pilot, in order to carry out some or all of the Medilink functions. In some cases, this meant adaptations to their existing computer systems, and in other cases it meant the introduction of computers to the practitioner site.

The type of hardware, software and telecommunications link installed was dictated by the individual practitioner circumstances, location and billing practices, but in all cases there was no cost to be incurred by the practitioner for participating in the pilot project.

The pilot project simulated a direct link to the Department, by making use of a third-party mainframe computer to perform the Medilink functions. Subsequent access to the Department was by magnetic tape on a weekly frequency.

PARTICIPANTS:

The participants were selected with the purpose of representing as broad a cross-section of practitioners as possible. Factors involved were type, location, size and current billing practices.

TECHNOLOGIES:

A broad range of technologies was used for testing during the pilot. This included different types of personal computers or point-of-service devices, different telecommunications connections, and alternative types of health care cards.

COSTS:

A number of cost factors were collected during the course of the pilot project. Many of these costs were significantly impacted due to the learning nature of the project, and would not provide meaningful information. The costs relating to the installation of Medilink in a practitioner's office are noted in this document.

3.0 BACKGROUND AND OBJECTIVES

The Medilink Pilot Project was set up under the umbrella of the Claims Redevelopment Project to determine the most practical and cost-effective alternatives to link the computing facilities in practitioners' offices to databases of Alberta Health information.

The objectives of this link were defined in the original Request For Proposal (RFP) as follows:

- To define the requirements for electronic access to the Department's data which is required in the practitioner's office for validation purposes.
- To demonstrate a reduction in delays and operating costs caused by errors and bottlenecks in the receipt and processing of claims, by issuing valid, authorized claims directly from the practitioner's office.
- To show how the administrative overhead to process claims in the practitioner's office and in the Department can be reduced.
- To demonstrate the feasibility and estimate the costs of a system which would allow the production of a statement of services rendered to a patient.
- To demonstrate to the practitioners and private sector hardware/software service providers, feasible and acceptable approaches to electronically submitting claims.
- To allow the Department to define technical standards for future communication with the Department's databases.

The practitioner requirements were focused on improving efficiency, as follows:

- Provide a method of validating patient eligibility.
- Provide a cost-effective method of submitting claims that will reduce overheads and minimize errors.

The Department requirements were focused toward reducing costs, as follows:

- Reduce the number of rejected claims requiring manual processing.
- Reduce the administrative costs associated with manually processing paper and tape submitted claims.
- Make patients aware of health care costs by producing statements in practitioner offices.
- Reduce the turnaround time for processing claims.

The functions described in the RFP were categorized as mandatory, optional and "value-added". The mandatory functions were those deemed essential to meet the stated requirements, as follows:

- Immediate eligibility check
- Electronic submission of claim details
- Production of a patient statement of services

The optional functions were identified to be useful additional functions, given that the mandatory functions are already in place. The inclusion of these functions would provide a great increase in productivity and efficiency in relation to the extra costs involved, as follows:

- Perform eligibility checks on large batches of registration numbers
- Inspect the results of this action
- Create claim records
- Update claim records at a convenient time
- Process claims refused by the host
- Process payment information received from the host
- Browse claim history
- Submit supporting information for claims.

The value added functions were those functions which were strictly out of the scope of the project or are not currently available in a fully-tested production form, but were identified as having potential value generally, but not exclusively, to practitioners. The following functions were identified, but this list was not intended to be exhaustive:

- Laser Cards/Smart Cards
- Electronic Mail
- Browse Proprietary Databases
- Access To Bulletin Boards
- Access To Redeveloped Statement Of Benefits

The pilot project participants were intended to represent a cross-section of practitioners, to include practitioners with the following characteristics:

- o single practitioner
- o multiple practitioner (e.g. clinic)
- o currently automated
- o currently not automated
- o located in Edmonton or Calgary
- o located in a major centre such as Red Deer, Lethbridge
- o located away from major centres.

Furthermore, the participants were to be exposed to the whole range of available technologies, as described earlier.

4.0 DESCRIPTION OF MEDILINK

The vendor selected to manage the pilot project was VCS Technologies Inc., based in Calgary. They were accredited as a service bureau to submit claims on behalf of practitioners. The communication links were established between the VCS mainframe and the practitioner offices, and claims were submitted to the Department weekly, using magnetic tape. Payment information was transmitted back to VCS weekly by magnetic tape.

The major difference between VCS and other service bureaux was the provision of extracts of Departmental database information, to enable eligibility checking and a more rigorous claim validation process to be carried out, prior to submitting claims to the Department. Otherwise, Medilink was set up to run in conjunction with all existing Departmental claims submission and processing functions.

This section describes the characteristics of the project.

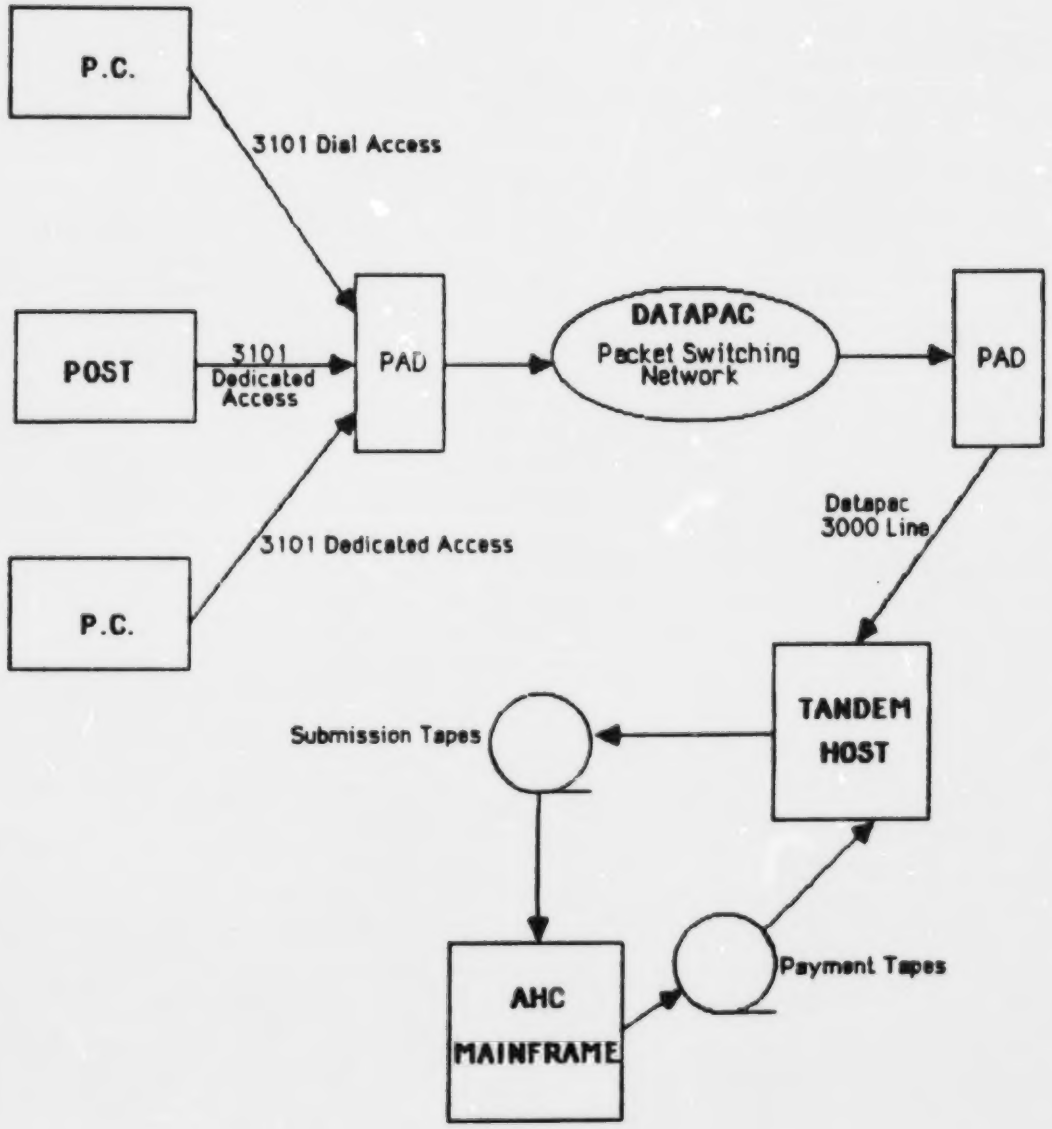
4.1 Hardware/Telecommunications

One of the intentions of the pilot project was to investigate as many combinations of hardware and telecommunications as possible, reflecting the wide variation in practitioner operations and geographic location.

The Medilink network utilized existing public telecommunications. Specifically, Telecom Canada's Datapac, a packet switched network, was the medium. Datapac 3101 (X.28 dedicated and dial access) was used for the asynchronous interactive access with PC's. Datapac 3000 (X.25) was the service used for communication with the network host. Communication on the network adheres to published standards of the Information Standards Organization (ISO) Open Systems Interconnection (OSI) regarding seven layer packet switched networks.

Diagram 1 depicts this network graphically.

Diagram 1 - Medilink Network



Two basic configurations were used at the practitioner sites:

Personal Computer (PC)

A variety of PC's were used, although it was not the intent to test all models available on the market. In most cases the PC already existed in the practitioner office.

Point of Service Terminal (POST)

VCS Technologies manufactures these devices, which are common in the retail industry, and provided custom units to a number of Medilink participants. The device allows the entry of information through a keypad, display on a small screen, and electronic transmission through a telephone line. Some devices used during the pilot project allowed the automatic entry of information from a magnetic card (like a bank card), or from a bar-coded card.

The POST was typically installed in low-volume practitioner offices.

Modem

This device was necessary to enable a PC or POST to link into a telecommunications network. Some participants already had a modem, but in most cases it was provided by VCS for the duration of the project.

Printer

Some form of printer was required in all participating locations.

Communications:

- Dial Access:
  - VCS RTime modem.
    (Datapac 3101 dedicated access was used at all sites at 1200 BPS (Bits per Second), with the exception of a few using 2400)
- Dedicated Access:
  - AGT 3101 modem and dedicated 3101 line.
    (Datapac 3101 dedicated access was used at high volume sites at 1200 BPS. 2400 BPS available in major centres)
  - VCS RTime modem.

The typical configuration required was as follows:

- IBM XT/AT/386 or 100% IBM compatible PC.
- Minimum 512 Kbytes RAM.
- Fixed disk drive (size dependent on the billing software being used, VCS communications software was less than 1 Mb).
- Serial port using 8250 UART.
- Communications:
  - Dial Access:
    - Hayes compatible 1200 BPS modem.
    - Stand-alone telephone line.
  - Dedicated Access:
    - AGT 3101 modem and dedicated 3101 line.
      (Datapac 3101 dedicated access was used at high volume sites at 1200. 2400 available in major centres)

The following table provides a detailed description of the twenty one configuration types as specified in the original VCS proposal. It should be noted that some locations changed configuration during the course of the pilot project, resulting in total figures greater than the number of locations.

Table 1 - Configuration Types

Configuration	Combination #	Description
#1 - Dial Up	1	PC
	2	PC with magnetic cards
	3	PC with bar code cards
	4	PC with smart cards
	5	POST
#2 - X.28/3101	6	PC
	7	PC with magnetic cards
	8	PC with bar code cards
	9	PC with smart cards
	10	POST
#3 - P.L.S.D. (Public Line Sharing Device)	11	PC
	12	PC with magnetic cards
	13	PC with bar code cards (or a combination)
	14	PC with smart cards
	15	POST
#4 - Microwave	16	PC
	17	PC with magnetic cards
	18	PC with bar code cards (or a combination
	19	PC with smart cards
	20	POST
#5	21	Mini-X.25/PC-Lan

The stated intention of investigating 21 different combination of practitioner, hardware, software and telecommunications was not achieved. Table 2 indicates the alternatives evaluated, and the text following the table provides reasons for non-evaluation.

Table 2 - Configurations Evaluated

Configuration	Number of Participants
#1 - Dial Up	
1	34
4	2
5	2
#2 - X.28/3101	
6	2
9	2
10	5
#3 - P.L.S.D.	
11 to 15	0
#4 - Microwave	
16 to 20	0
#5	
21	0

Mainframe to Mainframe Link

Although a number of large clinics were contacted by VCS, none of them agreed to participate. The main reason was the short duration of the pilot project, with respect to the effort required to apply system changes, and to the corresponding short evaluation period. The intention of investigating this option was to ascertain the ease and telecommunications cost of transmitting large volumes of information.

Microwave Link

This alternative was explored, in order to evaluate telecommunications alternatives for remote locations with relatively high volumes. The telecommunications providers could not install the system within the timeframe of the pilot project.

Professional Building

This was to be explored to evaluate the impact of sharing telecommunications costs across practitioners, but insufficient time was available to complete the significant number of tasks to implement such a configuration and then to make a realistic assessment of this configuration.

Plastic Cards

Only two smart cards readers were available from Toshiba. However, a number of other problems restricted the participants willing to try them, and they were withdrawn from two locations who found there was no use for them. With both smart cards and magnetic stripe cards, the limitation of not being transferrable to other practitioners diminished the effectiveness of the pilot project.

Magnetic stripe cards were used only on sites with the POST, which was set up to triggers transactions automatically from the "swipe" action. The software was not created to do this from PC systems.

4.2 Vendor Requirements

For all Medilink sites using PC's, the functions required for claim capture, submission and reconciliation were provided by third-party software vendors. VCS provided the telecommunications software required to connect the practitioner PC with the VCS mainframe.

The vendor software had to be enhanced to spawn a process to call the communications software. This involved the interactive processes which involved a single business transaction, such as eligibility checking, and the batch transmission functions which involved whole files of information to be transferred, such as claims submission and payment information.

The participant sites fell into two categories; those which were able to submit claims as well as perform eligibility checking and receive payment information; and those who were only able to use the interactive (value added) functions such as eligibility checking and claims validation. One site was set up with smart cards, and had no telecommunications link to VCS.

4.3 Extract Information

One of the main objectives of the pilot project was to investigate the suitability of validation of a patient's eligibility to receive service under the Alberta Health Care Insurance Plan, prior to receiving service in the practitioner office. In order to do this, information was produced from the Department's databases on a weekly basis in order for VCS to carry out this function. The information provided is described below.

Registration Extract

Created from the Registration Master and Claims History files, this was used for eligibility checking and as part of the edit checking process used prior to submission of claims to the Department. This file also contained the outstanding physiotherapy balance, calculated weekly.

Practitioner Extract

Created from the Practitioner Master File, this was used to verify the practitioner providing the service, and referring practitioners, prior to submission of claims to the Department.

Fee Code Extract

Created from the Fee Code Master File, used to edit fee codes and related dollar amounts, both on entry in the practitioner's office, and prior to submission of claims to the Department.

Lab Tests Extract

This file was not produced, as originally intended, due to the lack of useful information it contained after stripping confidential information from it.

4.4 Functions

This section describes the functions carried out during the pilot project. In order to assess the extent of their usage, the following table summarizes volumes:

Table 3 - Transactions By Request Type

Transaction Type		Total December	Average Per Day	Total YTD
A0	Eligibility Check	1,472	49.0	6,811
A1	Add/Update Claim Detail	248	8.2	848
A2	List Open Claims	121	4.0	364
A5	Claims Balance Request	3	0.1	55
A6	Claims Payment Request	138	4.6	1,489
A7	Registration Browse	4,564	152.1	13,181
AA	Submit/Resubmit Claim	16,047	534.9	58,898
AB	Change Password	0	0	0
AC	Delete a Claim	160	5.3	253
AD	Claims Validation	37	1.2	42

Eligibility Check

This function allowed the practitioner to enter an Alberta Health Care number to the PC or POST. The number was then transmitted to the VCS mainframe, and verified against the registration database. A response was then transmitted to the practitioner. If the number submitted was valid, then the response from the VCS mainframe would include the patient name, initials and sex code. The software package used would then display the appropriate information on the screen.

Where the number submitted was found to be an old number, then the response would indicate the current number, if the patient was eligible for service. If the number was found to be invalid, an appropriate message was transmitted to the practitioner.

This information was then available, if required, to build a claim without having to re-key the information. This was used for POST applications only during the pilot project.

The capability existed in some configurations to submit more than one number if required (batch eligibility check).

The eligibility check also included the capability to verify amounts against outstanding physiotherapy balances, and was extended to provide a name search capability.

Claim Creation

This function provided for the creation of a claim for service on the PC or POST. The software system would typically verify the information submitted, such as alphabetic or numeric verification, together with checks for completeness of information. The extent of this level of edit depended on the software system being used, but in the PC locations would usually provide the dollar amount automatically, given a service code.

On the POST locations, the basic information received from the eligibility check was used to create the basis of the claim record, with the service information added at a later time.

This function was already in use in some practitioner offices.

Claim Submission

This function transmitted claims entered on the PC or POST directly to the VCS mainframe via a telecommunications line. The frequency of claim submission to the mainframe was determined by the practitioner. Where Medilink utilized modified software packages, this function replaced the printing of the OCR form.

Mainframe Claim Edit

Upon receipt of a claim, the VCS mainframe performed a number of edits which were unable to be performed at the practitioner office. These edits consisted of verification of claim information against the extract databases, and the VCS mainframe notified the submission location immediately if errors were detected. If no errors were detected, then the claims were stored for submission to Alberta Health on a weekly basis.

Correction for Resubmission

The PC or POST was used to correct claims rejected by the VCS mainframe, at a time convenient to the practitioner, without the requirement for re-keying the entire claim information. The PC or POST software would perform its own edits against the new information, after which the claim could be resubmitted to the VCS mainframe.

Payment and Reconciliation

Each week, VCS received a magnetic tape of payment information, in exactly the same way as any other service bureau. Medilink then utilized the telecommunications link to transmit this information to the practitioner site. PC sites typically received the information in a batch file transfer, while POST sites requested a single payment record or multiple records to be transmitted and displayed. At the minimum, the practitioner could then print the information and perform a manual reconciliation against claims submitted or, depending on the software being used, have the PC perform an automatic reconciliation.

Again depending on the PC software being used, the practitioner could receive automatic reports of claims which have not yet been assessed by the Department, and potentially automated interfaces to other specialized software systems being used.

Claim Validation

This optional mainframe function would accept a claim and perform the edits, but would then respond to the submitter with the results of the edits. It would not hold the claim for submission to Alberta Health. This function was only used in one location.

Patient Statement

This optional function would print a statement indicating the services provided to a patient, prior to the patient leaving the practitioner office. The purpose of this was to make the public more aware of the cost of the health service, at the time of receiving the service. The Medilink project had a limited number of practitioners with this capability.

4.5 Practitioner Types

The purpose of the pilot project was to encompass a representative cross-section of practitioners, considering the following characteristics:

- o single practitioner
- o multiple practitioner practice
- o currently automated
- o currently with no automation
- o located in Edmonton or Calgary
- o located in another major centre such as Red Deer, Lethbridge
- o located away from a major centre
- o hospital ambulatory care.

The pilot project addressed all of these types. The following table describes the participants by category:

Table 4 - Participant Descriptions

Single:	15	Medical Sites:	30
Medium Size:	21	Physiotherapy Sites:	10
Large Size:	4		
Claim Submission Sites:	16	Dial-Up Sites:	31
Value Added Sites:	24	Dedicated Lines:	7
Smart Card Only Sites:	2	No telecomms:	2
Rural Locations:	6	Smart Card Sites:	2
Urban Locations:	34	Magnetic Card Sites:	4
Practitioner Submitting Claims:			54
Practitioners Using Value Added Functions Only:			218

4.6 Timing and Duration

The original intent of the project was to run 42 locations over a six month period. This represented two locations for each of the twenty one configurations described earlier. Due to a number of problems, 40 locations were fully installed, and a further four were installed but not functioning due to technical difficulties. This total did not represent all of the configurations originally planned to be evaluated. Furthermore, the time required to install Medilink was underestimated. The following table indicates the rollout schedule for sites submitting and those using only the value-added functions (eligibility checks etc.). The latest date for a practitioner to submit claims was December 31, 1989.

Table 5 - Participant Rollout

Month	Submission Sites	Total	Value Added Sites	Total	Grand Total
July	4	4	0	0	4
August	3	7	0	0	7
September	3	10	5	5	15
October	4	14	9	14	28
November	2	16	10	24	40
December					

There are a number of reasons for the participant list not meeting original expectations:

- the reluctance of medical billing software vendors to invest in changing their software for a relatively short duration, with no guarantee of continued usage;
- the time required to install a practitioner, from introductions and explanations, through site visits, telecommunications ordering and installation, to implementation and training;
- the impact on practitioner's operations for a relatively short duration, which would probably be followed by a further change at the end of the pilot project;
- technical problems encountered with telecommunications (e.g. the Datapac node at Red Deer).

4.7 Interaction With Existing Functions

It is important to describe constraints placed on the Medilink Pilot Project within the context of the existing claims processing systems and procedures. There are potential advantages to be derived by electronic submission which could not be demonstrated during the pilot period, due to the impracticality of changing these production systems, especially for such a short duration. The main factors are summarized as follows:

- The existing assessment system runs on a weekly frequency. This means that, whatever the frequency of Medilink claims submission to the Department, the frequency of assessment and returning the results of assessment remains fixed.

- The production of extract information was also tied to the weekly frequency of processing. This information was produced on magnetic tape and couriered to VCS in Calgary. Coupled with the time required to refresh the VCS databases, this meant that the extract information was not available to participant practitioners until the Thursday after the weekend processing.

- VCS was accredited as a service bureau and, as such, transmitted and received information via magnetic tape and courier.

- The Department was not set up to accept exception claims electronically. They still had to be submitted using OCR forms. The main examples are out-of-province claims, and claims which require supporting information to accompany the claim.

4.8 Volumes

Table 6 - Summary of Transaction Volumes

	Total December	Total
AHC claims submitted	11,837	44,662
Transactions Processed	22,887	90,061
Transaction Errors	1,022	14,925
Average Transactions per Day	762	246

Table 7 - Transactions By Request Type

Transaction Type		Total December	Average Per Day	Total YTD	
A0	Eligibility Check	1,472	49.0	6,811	
A1	Add/Update Claim Detail	248	8.2	848	
A2	List Open Claims	121	4.0	364	
A5	Claims Balance Request	3	0.1	55	
A6	Claims Payment Request	138	4.6	1,489	(1)
A7	Registration Browse	4,564	152.1	13,181	
AA	Submit/Resubmit Claim	16,047	534.9	58,898	
AB	Change Password	0	0	0	
AC	Delete a Claim	160	5.3	253	
AD	Claims Validation	37	1.2	42	

Note (1) This is an unusually high number, and does not reflect the number of times a Medilink practitioner would normally request payment information. For example, due to a system problem, 661 requests for payments were received in one day from a single practitioner.

The software currently in place also requires multiple requests for payment to be made from a multi-practitioner location. With further development, this would be reduced to a single request.

The pilot project also had a cumbersome method of requesting payment information, which caused confusion and an excessive number of requests to be made.

Diagram 2 shows the spread of the processing load on the VCS mainframe on a typical day. The main feature of the diagram is that the peak of submission activity occurs in the middle of the day. In a number of cases, practitioners found the Datapac lines were saturated at particular times of the day, and worked around these times accordingly. The processing times can be summarized as follows:

Mean	1.55 seconds
High	2.33 seconds
Low	0.69 seconds

Diagram 2 - Host Processing Time

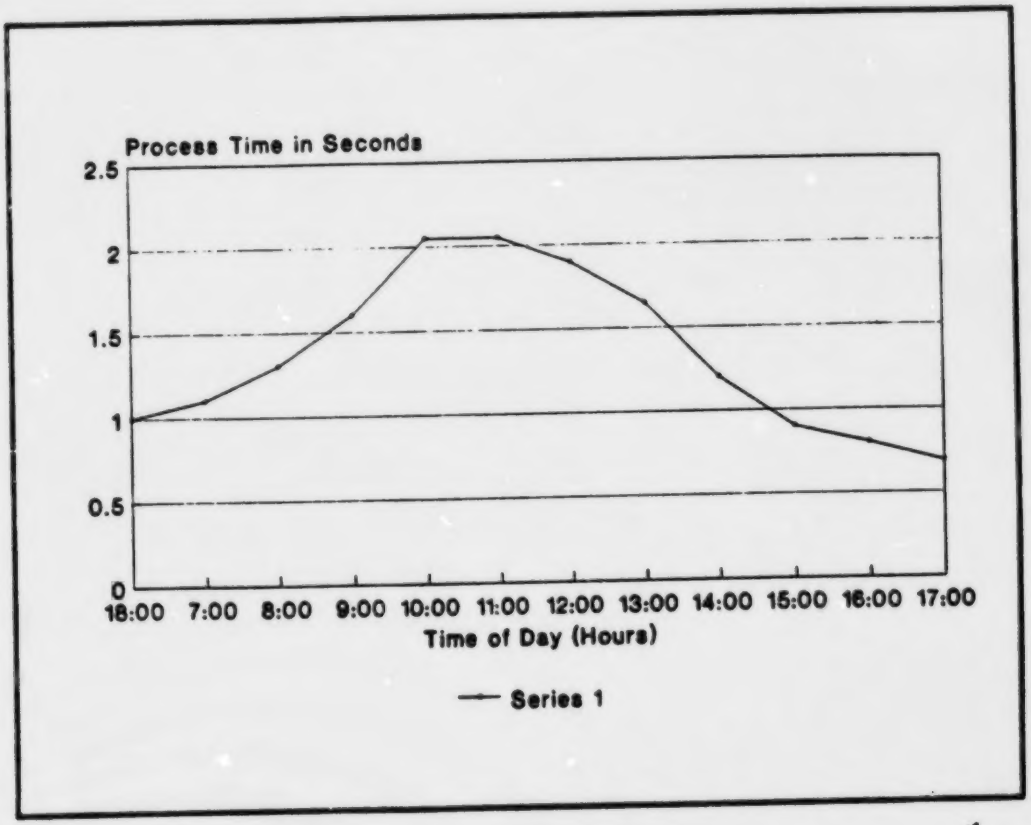
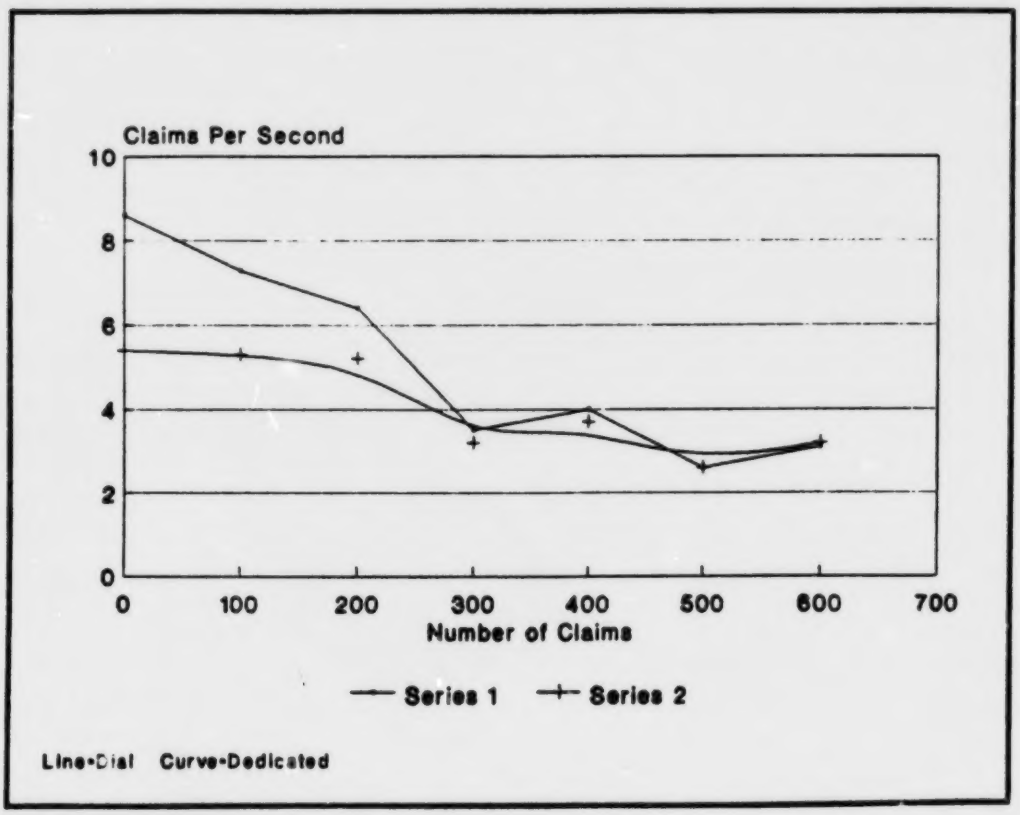


Table 8 - Transactions By Communication Type

	3101 Dial	3101 Ded	Total
Number of Sites	33	7	40
Dec Claims Submitted	9,298	6,955	16,253
YTD Claims Submitted	39,717	20,087	59,804
Dec Other Functions	1,693	4,817	6,511
YTD Other Functions	9,731	12,559	22,577
December Total	10,991	11,772	22,764
YTD Total	49,448	32,646	82,381

Diagram 3 shows a projected access time for the submission of varying numbers of claims.

Diagram 3 - Claim Submission Access



4.9 Alternative Health Care Cards

Two kinds of plastic cards were subject to a limited evaluation during the pilot project. The first was a plastic card similar to a bank card or credit card. This contained a magnetic stripe which contained the AHC number, while the name and initials were embossed on the card. The card also contained a bar-coded stripe containing the same information. The second kind of card used was called a "smart" card. This contained the same basic information as the magnetic card, but also had the capacity to hold up to three pages of textual information. This could be created, viewed and updated on the practitioner's PC, using a special reader/writer device.

In both cases, the pilot was only able to set up a very limited trial environment. Practitioners held the cards in the office, and used them only for regular patients.

5.0 FUNCTIONAL EVALUATION

This section provides a functional evaluation of the Medilink pilot project. It should be noted that practitioners were provided with a range of software products, which makes a strict comparative evaluation impossible to produce. Some practitioners already had billing software installed prior to Medilink, and well-proven packages adapted easily to Medilink, with little impact on the practitioner in terms of functionality and training requirements. The impact on practitioners with no previous automation was far more significant. This resulted in a variety of responses to any given Medilink function.

The sources of information used are as follows:

- Participating practitioner evaluation forms.
- Comments from participating practitioners during the pilot project.
- VCS Technologies Inc.
- Third party software vendors:
  - PJP System Consultants
  - Rogers Engineering Inc.
  - XI Consultants Ltd.
  - Peter Wilson
  - Sprint Systems Consulting Ltd.

The three general questions on the evaluation form show an overall positive reception to Medilink (the numbers represent the totals of all evaluation forms received):

Question: What was your overall impression of the functions provided by the system?

Excellent:	9
Good:	15
Acceptable:	6
Poor:	1
Bad:	0

Ease of Use

Question: How would you rate the ease with which the system could be used?

Very Simple:	13
Simple:	14
Acceptable:	3
Difficult:	1
Very Difficult:	1

Impact

Question: What overall impact did the system have on your day-to-day operation?

Positive:	20
None:	7
Negative:	2

The following table summarizes the evaluation found in this section.

Table 9 - Summary of Functional Evaluation

Function/# Times Used	Evaluation
Eligibility Check (6,811)	Extremely useful to certain sectors of practitioners, subject to program and data accuracy improvements.
Claim Creation (44,662)	PC creation extremely useful to most practitioners, but already exists in most software packages.
Claim Submission (44,662)	Very well received, especially where the OCR form was eliminated. General criticism of lack of electronic submission of exception claims.
Correction & Resubmission (14,236)	This was taken for granted as part of the system software.
Claim Validation (37)	This was a little-used function, and will probably not be required in the future.
Patient Statement	Almost unanimous dislike of the function, with only negative comments.
Payment & Reconciliation	Automated reconciliation is thought by some to be the biggest advantage of Medilink.
Alternative Health Cards	Recognition of potential for magnetic stripe cards, but not bar-coded cards. Smart cards had limited exposure, and found little requirement for their use.

The following sections provide a more detailed evaluation of individual functions. Where suitable, the responses to evaluation questions are also shown.

5.1 Eligibility Check

On-Line Eligibility Check
Question: How would you rate the usefulness and effectiveness of this function?

Excellent:	9
Good:	14
Acceptable:	2
Poor:	3
Bad:	1

Response Time for On-Line Eligibility Check
Question: How would you rate the typical response time for this task?

Under 5 seconds:	5
5 to 10 seconds:	13
Over 10 seconds:	8

Batch Eligibility Check
Question: How useful and effective is this function?

Excellent:	3
Good:	2
Acceptable:	2
Poor:	2
Bad:	0

Name Search
Question: How useful and effective is this function?

Excellent:	3
Good:	8
Acceptable:	2
Poor:	7
Bad:	1

The eligibility check function was found to be useful to a number of participants, although with some qualifications. Practitioners with a high rate of walk-in patients, especially some clinics and ambulatory care units, typically experience a high level of rejects due to invalid AHC numbers, and have found this function to be extremely useful. For all practitioner groups, there is also a potential for mis-keying the AHC number.

A great deal of time may be saved for the activities which surround refusal handling, correction and resubmission, with a corresponding reduction in the delay of processing such claims.

There are distinct groups of practitioners who have no use for the function:

- o practitioners with a high proportion of regular patients;
- o practitioners with a high proportion of referrals, or with a discipline such as anaesthesiology, where any eligibility checking has already been performed by the surgeon.

The major criticism of the eligibility check centred on the currency and accuracy of the information on which the eligibility check was based. As mentioned earlier in this report, the extract information is based on what existed on the Department's databases as of the previous weekend, but that is not available to the Medilink practitioners until the following Thursday. Some instances were recorded where a refusal was received, but the numbers were in fact valid. In those cases, the numbers were either new, or had recently been changed, and the information had not yet reached the Medilink databases. This caused some embarrassment to the practitioners concerned.

In the cases where the check must be performed prior to giving service, then speed of response is critical to this function. Where the check is made after service has been provided, then response time is not so critical, except to the operator performing the check. In some cases, especially for clinics or hospitals, checking a list of AHC numbers as a group proved to be useful.

VCS provided the capability to receive an "old" AHC number, and chain through the extract database to the latest number for that patient. The response to the practitioner would then be based on the new number, which is also communicated back for use on the claim and to notify the patient. This was usually well received, although with the previously-stated qualifications relating to accuracy and currency of information.

This problem would disappear if the AHC number were to remain the same for a patient throughout their lives, and this fact was mentioned by a number of participants and software vendors.

Outstanding Physiotherapy Balance

This component of the eligibility check was tried by a number of physiotherapists, with mixed reactions. In theory, the check is extremely useful, but the major criticism is the currency of information. This is more relevant than the actual eligibility information, due to the volatility of the data involved. Where a patient is making multiple visits to only one practitioner, then their own computer system (if used) is much more effective, and the better PC systems not only track the outstanding balance, but also provide warnings automatically when the limit amount is being approached.

For new patients, and patients visiting multiple practitioners, the facility would be very useful, especially with current information.

Name Search

This function was used when no AHC number was available, by submitting the surname, initials, date of birth and sex. It received a mixed reaction, for a number of reasons. The accuracy of information was a major factor, because all information submitted had to be a correct match with the AHC extract information. The POST devices were physically incapable of providing a list of potential patients, and the facility was not provided on the PC's.

This may prove to be useful to a number of practitioners, but the functionality of the software being used must be more in line with practitioner requirements, such as submitting only partial information.

5.2 Claim Creation

This function was already available on the market, and was very well received by practitioners in general. For those Medilink participants new to computers, this proved to be an extremely efficient method of creating claim details.

Electronic Billing
Question: How effective was this function for gathering claim details information?

Excellent:	4
Good:	4
Acceptable:	3
Poor:	1
Bad:	0

In particular, how would you rate the following features:

a) Ease of Use:

Excellent:	8
Good:	5
Acceptable:	2
Poor:	0
Bad:	0

b) Edit functions:

Excellent:	2
Good:	7
Acceptable:	4
Poor:	0
Bad:	0

c) Ease of finding information already in the system:

Excellent:	3
Good:	3
Acceptable:	2
Poor:	3
Bad:	0

A number of participants already had software packages which gathered the information required to produce a claim. The Medilink project provided no improvement in that functionality, and was not intended to do so. For those practitioners with no previous automation, the systems installed generally provided (in some cases significant) improvements in the efficiency of creating claim details.

In particular, keying errors were almost eliminated, and most participants talked to welcomed the elimination of the OCR form. It should be noted that exception claims such as those for out-of-province patients, and those requiring supporting documentation, still had to be submitted using OCR forms. This was a consistent source of complaint by participants.

A number of participants wanted the software to be customized to their needs, and this was often impractical within the constraints of time and budget. The major source of this criticism was physiotherapists, whose billing and business procedures are more complex than those of medical practitioners. Others wanted more automated links with their charts and patient history. One function which was not implemented in time for the pilot project was the ability to collect claims information for more than one practitioner without signing-off and back on again.

The POST generated most of the practitioner criticisms in this area, due to the lack of an alphabetic and numeric keypads. The solution presented was to switch modes on the same keypad, which resulted in a cumbersome method of data entry.

5.3 Claim Submission

Claims Submission
Question: How effective was this function?

Excellent:	4
Good:	6
Acceptable:	3
Poor:	1
Bad:	0

This was generally a well-accepted function, with the exceptions of those problems related specifically to the POST, and to those locations where multiple practitioner claims were processed. The potential exists for a very efficient submission procedure, to replace the printing of OCR forms.

5.4 Correction and Resubmission

Correction and Rebilling
Question: How useful and effective was this function?

Excellent:	1
Good:	2
Acceptable:	2
Poor:	2
Bad:	0

The ability to correct the fields in error and resubmit, rather than re-keying the entire claim was well received, although the actual implementation of the function remains to be streamlined in some systems.

5.5 Claim Validation

This function was suggested rather late in the project, and was only implemented at one location. This location did not have reconciliation features, and used this function to reduce the incidence of submission errors. It was thought that the function may be useful for claims which can not currently be submitted electronically (out-of-province etc.), to reduce the incidence of errors and therefore the time and effort required to correct and resubmit. Out of 37 claims submitted for validation, 8 were detected as containing errors.

5.6 Patient Statement

Patient Statement of Service
Question: Please indicate to what extent you used this function:

Never:	5
0-10%	0
10-25%	0
More than 25%	0

Please indicate the typical reaction of the patient receiving the statement:

Positive:	0
Indifferent:	1
Negative:	0

This function was hardly used at all during the pilot project. The few comments received indicated no real reason for using it, and a number of reasons not to use it: the main one being the disruption to the office procedures to stop and produce the statement prior to the patient leaving the office.

Some practitioners already had the function in place, and used it for insurance billing and direct patient billing only.

5.7 Mainframe Claim Edit

The VCS mainframe took advantage of the extract files received from the Department to perform a level of edit and validation not able to be performed on a PC or POST, prior to submission to the Department. Any rejects could then be transmitted back to the practitioner for correction and resubmission, thus eliminating the one week delay of waiting for the Department to perform the same process.

The result of this function is difficult to distinguish from other levels of edit and validation which take place prior to reaching the mainframe. The level of edit error received by the Department is extremely low.

5.8 Payment and Reconciliation

Automatic Reconciliation
Question: How effective was this function?

Excellent:	4
Good:	2
Acceptable:	0
Poor:	0
Bad:	1

Automatic Reconciliation

This feature was thought by some practitioners and most of the third party software vendors to be the biggest advantage of the Medilink system. One site reported a reduction in manual effort of six to eight hours each week. With a well-designed control system (claim numbering especially), and a good software billing package, the practitioner should have a highly productive tool at his disposal. This would remove the manual effort required to reconcile, and would automatically report on the outstanding claims only. The function was well accepted by practitioners with or without previous automation of their billing procedures, subject to the qualifications described below.

The implementation suffered from an over-complex method of use, whereby it was not clear to the operator exactly which week of payment information was being retrieved. Streamlining this aspect of reconciliation would have made the acceptability much higher for a large number of practitioners, as would the rationalization of the claim numbering process.

Manual Reconciliation

Manual Reconciliation
Question: How useful and effective were the functions based on the A/R file?

Excellent:	1
Good:	3
Acceptable:	2
Poor:	1
Bad:	0

This received mixed reviews, especially due to the way in which claim numbers were allocated by the VCS mainframe, with resultant problems in matching practitioner claims to the details of the Statement of Account. The POST does not lend itself to automatic reconciliation.

5.9 Other Functions

A number of other practitioner functions were provided along with the Medilink software. These did not receive wide exposure, due to the range of third-party software products being used. The requirements for billing-related functions such as patient master file maintenance vary across practitioners, and were not extensively used during the pilot project.

5.10 Incidence of Errors

Although difficult to quantify, a number of practitioners, particularly those new to the use of computers, noticed a reduction in the volume of errors, and noted the corresponding amount of effort required to resolve errors.

Claim Errors
Question: What effect did the system have on the incidence of errors?

Decrease:	11
None:	4
Increase:	1

Table 10 - Eligibility Check

December 1989	- number of checks made:	1,472
	percentage invalid responses:	19.7
Year to Date	- number of checks made:	7,532
	percentage invalid responses:	27.3

95% of the invalid responses are due to inactive, unknown or invalid AHC numbers; the remainder are due to message errors, invalid passwords and invalid user-id's.

Table 11 - Claims Submitted to VCS

December 1989 -	claims submitted:	16,047
	percentage invalid:	2.6
Year to Date -	number of checks made:	64,866
	percentage invalid:	4.5

This includes checksum failure and invalid claim submission values.

An attempt was made to measure the reject rate of claims submitted through the Medilink process, in comparison with claims submitted outside of Medilink. This would have compared the non-electronic submission of claims by Medilink participants (e.g. out-of-province claims), as well as those submitted by non-Medilink practitioners. With the information available from the Medilink system as well as the current claims processing system, no clear conclusions were able to be drawn.

One measurement taken is shown in the following table. This consisted of running the tapes received from VCS against two programs which are used to screen for two ranges of edits. At the same time, the tapes from other service bureaux were passed through the same programs. The reject rates are extremely low for this kind of edit, but the results are as follows, for data collected over an eight week period:

Table 12 - Rejects Detected from Submission Tapes

Submitter	Claims Submitted	Number of Rejects	Reject %
VCS	28,228	1	0.00
Other Service Bureaux	124,294	29	0.18

Even with such low reject rates, 0.18% of the 550,000 claims received each week by the Department projects to 990 reject records.

5.11 Turnaround of Claims and Refusals

This is extremely difficult to project for a province-wide Medilink system, due to the limited extent of the pilot project, and the fact that a number of teething problems were encountered and (in most cases) resolved during that period. The only information on which to base any form of evaluation is to refer to the participating practitioner comments, as follows:

Turnaround of Refusals
Question: Did the system have good, bad or no effect on turnaround processing?

Good:	5
None:	7
Bad:	0

Specific comments from the evaluation form were as follows:

- Once data was submitted to AHC, claim processing, subsequent payment retrievals and refusal information were received once weekly - no change.
- Can't recall any refusals to date!
- We could make corrections and deal with refusals right away instead of waiting 6 weeks till we got a statement back from AHC.
- For the ones we sent in, turnaround was not greatly improved.
- (Response None) About 3 weeks.

Subsequent to completion of the first phase of the pilot project, a study was performed on the elapsed time between date of service and date of payment, and also on the date of receipt by the Department against the date of payment. The results of this 6-week study are summarized below:

Submission Type	From Date of Service	From Date Received
OCR Claims	25.3 days	11.3 days
All service bureaux	23.6 days	9.2
All claims	25.5 days	10.6 days
Medilink claims	17.7 days	9.4 days

5.12 Interaction With Existing Functions

Some potential advantages to be derived by electronic submission could not be demonstrated during the pilot period, due to the impracticality of changing these production systems, especially for such a short duration. The main factors are summarized as follows:

- The weekly frequency of the existing assessment system meant that, whatever the frequency of Medilink claims submission to the Department, the frequency of assessment and returning the results of assessment remained fixed.

- The extract information was produced on magnetic tape and couriered to VCS in Calgary. Coupled with the time required to refresh the VCS databases, this meant that the extract information was not available to participant practitioners until Thursday after the weekend processing. This was not a significant problem for relatively stable information such as schedule of benefits information, but became significant for such information as the outstanding physiotherapy balance.

- It was not possible within the pilot project to examine the suitability of a direct telecommunications link between the VCS and Departmental mainframes. This had the potential to markedly improve service to the practitioner in terms of a much shorter deadline for weekly claims assessment, and more rapid transmission of assessment results.

- Although a practitioner may have been using the Medilink facilities (and indeed any automated software package), a number of claim types still had to be submitted using OCR forms. The main examples are out-of-province claims, and claims which require supporting information to accompany the claim. In these cases, the Department was not set up to accept such information electronically, even though the software packages could have been adapted to do so.

5.13 Alternative Health Cards

Alternative health Cards

Question: If you used any of the alternative cards during the project, please check the type used:

Bar Coded Card	4
Mag Stripe Card	4
Smart Card	2

Question: How would you rate the success and applicability of the cards used?

Excellent:	2
Good:	0
Acceptable:	3
Poor:	1
Bad:	0

Plastic cards were introduced in a few of the Medilink sites. The magnetic card also contained a bar-code. The smart card was introduced to three locations, one of which returned them because they could find no use for them.

Most of the comments received were general (ethical, moral, security related etc.) rather than technical. In the case of smart cards, the technical issues are far outweighed by the general issues.

Magnetic Cards

The magnetic card was used in four locations, which all used the POST rather than a PC. They were kept in the office for regular patients, and used to enter the basic patient information into the system by "swiping" the card through a slot in the POST, or by passing a "magic wand" across the bar code.

It was found that the swipe facility performed far more reliably then the bar code. The result of successful use was the elimination of time and effort to key-in the information to the system. The secondary result was that the information could not be mis-keyed, leading to a reduction in errors and the time required to correct and resubmit.

There are non-technical considerations to be addressed with magnetic cards, such as their use for dependents, but otherwise this is well-proven technology with a real potential for use as a replacement for the current AHC card.

Smart Cards

The implementation of the use of smart cards was extremely basic. There were three pages of information accessible to the practitioner, with very limited text-handling functions. It was difficult to see a requirement for them in the practitioner office (rather than being held by the patient) which was not already addressed by a chart system.

The access time of each card was excessive, which possibly reflects the technical state of development of this new technology. The impression left was of a new technology looking for a reason to be used, rather than a new technology addressing a business or processing requirement.

5.14 Practitioner Training Requirements

Question: Quality of training

Excellent:	7
Good:	13
Acceptable:	3
Poor:	2
Bad:	1

Question: Time and effort required for training

Excellent:	12
Good:	11
Acceptable:	0
Poor:	2
Bad:	0

The requirement for training practitioners or their billing staff varied considerably across the participants. The major factor involved was the presence or otherwise of computers in the office prior to the installation of Medilink.

It was found that, in some locations where computers were already in use, and especially where claims billing software was already in place, then the requirement for extra training was minimal. All that was required in some locations was one hour of training, with occasional telephone support after that. With the elimination of some of the problems associated with the functions of the pilot, even this telephone support requirement would be minimal in some cases.

A large number of locations with some exposure to computers could require no more than one day of training, with telephone support afterwards as required.

It was found, as no surprise, that the most training and subsequent support was required for those locations where there was no previous exposure to computers. In these cases, there was more of a training requirement for computers in general than there was for the billing procedures in particular. The greatest number of hours recorded during the Medilink pilot was about 40 hours for one site. This was the exception, but it confirms the point that there is no fixed time period which a practitioner who is thinking about electronic claims submission should budget for training.

Practitioners should be prepared to pay for this extra support, estimated in the range of $30 to $50 per hour, plus expenses, depending on the vendor.

Some of the requirement for support was also related to the identification and resolution of problems - related to hardware and telecommunications mainly, that would not normally be expected in a production environment.

5.15 Improvements Requested by Participants

The general level of comments was positive. With few exceptions, participants would like to see the concept refined prior to being offered as a production system province-wide. The major qualifications reported were as follows:

1. The POST used during the pilot project was generally felt to be not suitable to this environment. This does not exclude potential sites which merely require Medilink for eligibility checking, together with a magnetic stripe card, if available. This would provide an efficient service to the practitioner, should it be beneficial in his circumstances. The capacity for holding and processing information is very restrictive for a typical medical practice. An upgrade to provide a full keyboard would probably put the price in the range of a small PC, with none of the processing capabilities and flexibility which a PC would provide.

   The POST was felt to be extremely cumbersome without a full keyboard, due to the need to enter alphabetic as well as numeric data. Movement between three sets of keypads was a common criticism.

2. The timeliness and accuracy of AHC extract information. Related to this is the question of a permanent patient number.

3. Practitioners typically want a certain amount of custom development in the software installed in their office.

4. A number of relatively small refinements to the software applications would be required for a full production environment. This applied in particular to the method of numbering claims (for future reference), a more straightforward reconciliation procedure, and a more flexible name search procedure. None of these are "show-stoppers" in terms of software development, but combine to limit the effectiveness to the operator in the practitioner office.

5. It was felt that submission of exception claims on OCR forms should be eliminated in order to take full advantage of Medilink.

6. Problems related to telecommunications away from Edmonton and Calgary must be resolved (e.g. Red Deer, Lethbridge), together with possible problems encountered with one particular edmonton telephones exchange. All of these problems are under review, but the limited nature of the pilot project prevented an exhaustive evaluation of every node in the province.

7. It was suggested that the physiotherapy schedule of benefits should be streamlined to eliminate the large number of low price services.

8. Look at the submission of supporting documentation via Medilink, which may simply be printed at the Department short term. An alternative to this is to use Medilink E-Mail, if it comes about.

9. Consider a transaction for Medilink, or E-Mail, to derive a newborn baby AHC number immediately, prior to submitting a claim.

10. Consider allowing practitioners to send updates to registration to the Department through Medilink or E-Mail (e.g. where the Date Of Birth contains zeros, or for change of address).

6.0 TECHNICAL EVALUATION

6.1 Hardware

A variety of combinations of hardware were utilized during the pilot project. The experience gained during the pilot project enables a projection of the typical cost of installing Medilink in a practitioner's office to be made. The typical hardware requirements were found to be as follows:

- IBM XT/AT/386 or 100% IBM compatible Personal Computer
  - Minimum 512 KBytes RAM
  - Fixed disk drive
    (Size dependent on office software being used)
  - Serial port using 8250 UART
- Communications:
  - Dial Access:
    - Hayes compatible 1200 (or higher) modem
    - Stand alone telephone line
  - Dedicated Access:
    - AGT 3101 modem and dedicated line.

This kind of configuration would enable all of the basic Medilink functions to be performed. For those practitioners with greater requirements, then more sophisticated (and therefore more expensive) hardware would be required. In most locations used during the pilot project, it was found that equipment which is readily available on the market will do the job, within the constraints of the limited range of hardware tested.

If the use of a magnetic health card is required, then the costs of a magnetic swipe card reader would also have to be incurred. Although no swipe card readers were used on PC's during the pilot project, various alternative devices are available on the market, including stand-alone devices, replacement keyboards which have a reader built-in, and devices which can be connected to the existing keyboard or to the communications port. Prices range from $80.00 U.S. to $220.00 U.S.

Although most of the hardware used performed satisfactorily, a number of problems encountered during the pilot project were directly related to the hardware used. These are under various stages of review, and are described as follows:

1. IBM PS/2 Model 30
   Because of a subtle difference in the BIOS (Basic Input/Output System) and/or UART (Universal Asynchronous Receiver Transmitter), the PC hung or behaved erratically after running the communications software. Since the solution to the problem required a rewrite of the communications software, VCS provided a PC for the site. IBM have been notified of the problem, and solutions were being tested at the time of releasing this report.

   Subsequent investigation resolved all problems associated with the PS/2.

2. Everex Internal Modem Card
   A number of XI sites used this internal modem. Because the Everex command set was not fully Hayes compatible, a modification to the software was necessary.

3. Zenith Laptop 286
   This was configured to use the internal modem on COM2, which does not have a true 8250 UART, so an external modem was provided and COM1 was used for communications.

It is reasonable to assume that many PC's available on the market should be able to perform the basic Medilink functions, with no requirements for any special hardware features.

6.2 Transaction Response Time

It was found during the project that a typical transaction response time was in the range of five to six seconds, with the following qualifications:

- this does not include the time required for dialling;
- it does not include the fact that if Datapac is saturated, a redial is required (or try later);
- it does not include application processing time, which will vary across software systems - it applies only to the time from initiating the telecommunications software to receiving a response on the screen;
- the telecommunications setup and connection time will vary considerably between a dedicated line and a dial-up line.

Further analysis has shown that transmission rates of three to four claims per second are possible, given volumes over 100 per batch.

6.3 Transaction Response Time Analysis

The following table represents the breakdown of a typical Medilink transaction, recorded in seconds:

Table 13 - Transaction Response Time Analysis

1.	Wait on input	0.00	
2.	Input Transmission 132 characters/1200 BPS = 1320/1200	1.10	
3.	Network Transit Delay	0.750	(1)
4.	Wait On Input (0.75(0.11)*(1320/9600))/1-0.0189 (2)	0.0089	
5.	Output Transmission 132 characters/9600 BPS = 1320/9600	0.1375	
6.	CPU Processing Time	1.555	(3)
7.	Wait On Output (0.75(0.08)*(1320/9600))/1-0.0189 (2)	0.0127	
8.	Input Transmission 132 characters/9600 BPS = 1320/9600	0.1375	
9.	Network Transmit Delay	0.750	(1)
10.	Wait On Output	0.00	
11.	Output Transmission 132 characters at 1200 BPS	1.10	
	Response Time	**5.551 seconds**	

Notes:

(1) As quoted by AGT (average Network Propagation Delay for interprovincial traffic.

(2) (0.75 R * Tp) / 1 - R

where R = Tp * average packet arrival rate
Tp * (0.11 on input), (0.08 on output)
Tp = Average packet size / Access line speed
1320/9600

(3) CPU processing time is an average of three types of transaction over a full day of processing.

Packet overhead 9 characters
Access line use input 11%, output 8%

6.4 Telecommunications

The Medilink network architecture is based on asynchronous devices located at the sites, the lower speed asynchronous information is later converted to synchronous, multiplexed and increased in speed before it reaches the mainframe.

This type of network design allowed the pilot to take advantage of the built-in communications capabilities of most PC's and POST terminals.

Packet switching networks were implemented to route and concentrate the information from the sites to the mainframe. All dial-up sites dialled their nearest node, if leased lines were used the line ran from the site to the node (not to the mainframe). The packet switching component of the network was unknown to the user and was only utilized for cost effectiveness.

CNCP

The pilot project set out with the intention of utilizing two telecommunications networks, as provided by CNCP and AGT (Datapac). A number of problems were encountered using the CNCP facilities, although one of the sites provided with CNCP telecommunications (Lynwood Medical Clinic in Calgary) received satisfactory service.

VCS encountered a number of CNCP support problems while attempting to install Medilink using CNCP telecommunications. Where problems were encountered, it proved to be difficult to resolve them. In some cases it was impossible to install a line of any form. VCS eventually made the decision to withdraw all CNCP locations in favour of Datapac.

Datapac

After experiencing some initial problems, the Datapac service provided good service to the pilot project. It was not possible to set up a microwave link to the Rocky Mountain House site due the lead times required for equipment authorization and delivery, and significant problems were subsequently experienced by this location when trying to dial in to the Red Deer node. This type of problem would have to be resolved prior to installing a permanent service, as it proved impossible for the staff at the site to obtain sufficient access to telecommunications to submit all of their claims through Medilink.

The telecommunications utilized consisted of 7 3101 dedicated lines for high volume locations (clinics, hospitals), and 33 dial-up 3101 for the remainder of the locations.

System Availability
Question: Was the system available at the times you wanted to use it?

Always:	9
Usually:	11
Rarely:	1

6.5 Security

Medilink security was targeted at 3 levels:

1. **PC and POST**

   This first level of security was left for the site to decide, the options being changeable by the site personnel as follows:

   - o no host password
   - o a single host password
   - o a host password for every practitioner
   - o PC level system security (vendor-specific).

2. **Telecommunications**

   As Medilink was designed on a transaction processing platform, none of the traditional user log screens were incorporated. Each transaction was a strictly formatted, self-contained entity complete with its own password (if applicable), and site identification. The site identification number was checked against the calling address to determine if the transaction was actually coming from the correct site. A basic form of data encryption was used during the pilot project.

3. **Mainframe**

   - o External communications security: there were no other outside communication lines on the production system other than those configured for Medilink.

   - o VCS internal access to information was restricted to a senior operator and a systems administrator. All updates to production data were logged. A separate processor was used for development.

   - o External entry: VCS' offices and computer room are locked and alarmed.

7.0 ECONOMIC EVALUATION

This section presents the financial information gained during the pilot project, according to the following breakdown:

Cost Summary
Benefits
Qualifications
Capital Costs
Telecommunications Costs

7.1 Cost Summary

The costs of installation of Medilink in a practitioner site are detailed later in this section as between **$2,000 and $10,300** for a single configuration, ranging from a basic system for a low-volume practitioner, to a typical set of functions for a high-volume practitioner.

Transaction costs are also estimated at approximately $0.0074 per claim unit (one claim submitted, together with receipt of payment information, and an estimated incidence of eligibility checking, resubmission and telecommunication error). Therefore, for a practitioner submitting 50 claims per day over a 20-day month, the telecommunications costs would be **$7.40**.

Added to this would be the installation and monthly charges for telecommunications. For a single trunk with touchtone in Calgary, this could be **$26.86** per month, and **$45.00** for installation. These figures vary significantly by geographic location, and telecommunications used.

These figures do not include the costs of setting up, running and maintaining a mainframe computer system to drive a Medilink-type of environment. These figures will be produced at a later date, using information gained during the pilot project.

7.2 Benefits

The benefits to be gained from Medilink are difficult to quantify, and are simply listed below:

To the Practitioner:

- o more accurate efficient entry of claims information;
- o prompt identification of errors;
- o efficient resubmission procedures;
- o reduction in manpower requirements for billing procedures;
- o reduction in effort required to resolve problems;
- o automatic reconciliation of payment information;
- o potential for automated feed to other computer applications;
- o potential for reduction/elimination of paper submissions;
- o potential to expand functionality as required;
- o flexibility of choice for billing systems.

To the Department:

- o potential for reduction/elimination of paper submissions;
- o reduction in requirement to process error claims;
- o reduction in effort required to resolve problems.

To the Private Sector:

- o business opportunities to respond to market requirements.

7.3 Qualifications

A strict economic evaluation of the pilot project proved to be extremely difficult, due to the following reasons:

1. There were very few clear instances of installation and running Medilink which did not entail some form of learning curve for some of the players concerned. The amount of support initially required, especially for those locations with no previous exposure to computer-based systems was underestimated.

   A number of software changes were developed and applied as a direct result of experience in using the system. Examples are the problems encountered while "chaining" from old AHC numbers to new ones, and the problem of the sex code field on the registration extract containing data other than "M" or "F" (Male or Female). The costs involved in such activities would not normally be incurred in a production environment, but VCS and the third party vendors went to great lengths, within the constraints of time and budget, to provide an effective system.

2. The pilot project deliberately set out to investigate the use of hardware, telecommunications and software functions simply to evaluate their feasibility and acceptability to the practitioner community. This included POST and smart card usage. As such, costs were incurred which would not normally be incurred in a production environment.

3. Time and effort was expended on the production and maintenance of extract information, based on assumptions which did not always materialize. This included the volumes and accuracy of information.

It should also be noted that the pilot project encompassed 40 locations, out of a total of over 3,500. Furthermore, only 54 practitioners submitted claims through Medilink, together with a further 218 practitioners who had the value-added functions available to them. As well as being statistically very small, the participant number is also "biased" to some extent as being those practitioners who by inclination and circumstances were willing and able to try these new functions. It is not possible to extrapolate the results of Medilink with any great degree of mathematical certainty.

7.4 Capital Costs

The following table shows an estimate of the capital costs which would be incurred for the installation of Medilink in a number of typical practitioner environments. Due to the wide variety of factors involved, a comprehensive table could not be generated. However, this table could be used as a guideline, and practitioners with different expectations could adapt the figures to their situation. The figures are based on the following assumptions:

Configuration

Only two configurations are considered here:

- o a basic, no frills billing system;
- o as above, with the addition of word processing, chart handling and accounts receivable functions.

Two figures are provided for each of the following items, based on these two configurations.

Personal Computer

A PC will be used, rather than a POST, with the characteristics defined in section 6.1 Hardware. Furthermore, a single PC station is assumed rather than a network, and a standard monochrome screen will be used.

Modem

A 2400 BPS modem has been assumed. Although a 1200 BPS will perform the required functions in many sites, the price differential is minimal. For high volume sites, the difference between a 2400 and 9600 BPS modem must be added.

Printer

The assumptions here are for either a very basic dot matrix printer, or a larger "workhorse" printer. Laser printers were not included.

Software

Estimates were provided for a basic package covering the Medilink functions: eligibility checking, claim collection and submission, claim correction and resubmission, and reconciliation; also for a more extended package as described above. The estimates include installation and a maximum of 8 hours of training: any further support requirements would incur additional costs.

Table 14 - Capital Cost Factors

Cost Factor	Basic System	Extended System
Personal Computer	$1,100	$5,000
Modem	$ 150	$ 800
Printer	$ 250	$1,000
Software	$ 500	$3,500
Range:	$2,000 to	$10,300

A number of factors will influence where in this range an individual practitioner will fit:

- Functional Requirements - the more functions required in the practitioner office, the higher the cost will be. This will be reflected in the PC requirements for a more powerful PC, a more comprehensive software package, and higher telecommunications charges;

- Volume of Claims - the more claims are processed, the greater the telecommunications costs, and the greater the requirements for hardware;

- Geographic Location - proximity to a telecommunications node is critical to the costs incurred. For those locations away from a node, long distance charges will apply. Furthermore, the installation and monthly rental rates vary considerably across the province. Finally, on-site support requirements for billing software packages will also vary according to location.

- Practitioner Type - a multi-practitioner office is able to take advantage sharing costs. This may also apply to a professional building containing multiple practitioners, subject to the physical constraints of the building.

- Existing Computerization - practitioners with computers installed prior to Medilink have little or no incremental hardware costs, and minimal training and support requirements for the new functions. Practitioners new to computers, however, not only incur the full hardware and software costs, but billing staff require basic training in computers as well as the billing software being used.

7.5 Telecommunications Charges

This section provides some examples of network offerings in different geographic locations, together with associated costs.

1. Data Grade Dial Lines

These are lines which have been conditioned by the telephone companies to a level which supports data communication to required levels.

Single Trunk with Touchtone

	Monthly Rental $	Installation $
Smoky Lake	17.38	45.00
Wetaskiwin	21.38	45.00
Calgary	26.86	45.00
Edmonton (Ed Tel)	34.80	45.00

Data Equipment on Trunk

AGT	5.00	40.00
Ed Tel	3.95	35.00

2. Datapac 3101

This is a Telecom Canada access method supporting devices (PC's) which comply to X.28 protocol.

		Monthly Rental $	Installation $
Private Dial			
	1200	164.00	150.00
	2400	184.00	150.00
Public Dial			
	1200	0.00	0.00
	2400	0.00	0.00
		0.04 holding time	
Dedicated (All 1200)			
	On Network	165.00	150.00
	Off Network		
	Rimbey	431.00	345.00
	Wetaskiwin	447.00	270.00

3. Datapac 3201

This is a Telecom Canada access method supporting POST devices which comply to X.28 protocol.

Dedicated			
	On Network 1200	170.00	150.00
	2400	185.00	150.00
	Off Network		
	Rimbey		
	1200	435.00	345.00
	2400	446.00	345.00
	Wetaskiwin		
	1200	454.00	345.00
	2400	462.00	345.00

4. Datapac 3000

This is a Telecom Canada access method which complies to X.3 and X.28 protocols.

		Monthly Rental $	Installation $
On Network			
	2400	220.00	250.00
	4800	325.00	250.00
	9600	465.00	250.00
Private Line			
	Rimbey	750.00	120.00
	Wetaskiwin	515.50	120.00

8.0 CONCLUSIONS

8.1 Summary

The Medilink Pilot Project overall has received a very positive response from the parties involved. It has demonstrated that Medilink is a viable alternative to other forms of claims submission across the province. The response to the following question on the participant evaluation summarizes Medilink in the simplest way:

Future Plans
Question: Based on the limited functions the pilot offered, would you recommend that Medilink be developed and offered to all practitioners?

Yes:	21
No:	0
Undecided:	6

Twenty one out of twenty seven responses recommend future development, with no participants recommending that Medilink be stopped.

The pilot project demonstrated that all of the component parts required are available on the market, and are able to be integrated as required:

- PC's or POST's;
- practitioner software packages;
- modems;
- telecommunications software;
- telecommunications networks;
- mainframes.

Medilink has shown that refinements must be made prior to implementing province-wide, to provide practitioners with better functional operations in areas such as claim numbering and payment information retrieval. It is also apparent that further policy issues must be addressed, and control procedures designed and implemented. The principal stands, however, that these are able to be achieved, with the result being benefits to all parties concerned, and practitioners having the freedom of choice of submission procedures.

8.2 Performance To Objectives

The Medilink Pilot Project performed according to the stated objectives as follows:

1. To define the requirements for electronic access to the Department's data which is required in the practitioner's office for validation purposes.

   The advantages to certain groups of practitioners was clearly identified, together with an identification of areas for improvement prior to making the functions available in production.

2. To demonstrate a reduction in delays and operating costs caused by errors and bottlenecks in the receipt and processing of claims, by issuing valid, authorized claims directly from the practitioner's office.

   The reduction of paper requirements was clearly identified. A reduction in the refusal rates of claims submitted through the Medilink process was demonstrated by some practitioners. This would result in claims flowing through the process once only, with reductions in the requirement for practitioner and Departmental staff to investigate and correct refusals.

3. To show how the administrative overhead to process claims in the practitioner's office and in the Department can be reduced.

   The early identification of errors, and streamlined methods for accurate correction and resubmission were clearly demonstrated. The corresponding reduction in follow-up activities, including the inquiry and investigation process, was clearly identified. The capability of performing automatic reconciliation in the practitioner office was probably the largest single benefit to practitioners.

4. To demonstrate the feasibility and estimate the costs of a system which would allow the production of a statement of services rendered to a patient.

   Some practitioners already had this capability on their software systems, to produce statements for insurance purposes. The pilot project merely confirmed the feasibility. Although detailed costs can only be estimated, they are negligible, given that a Medilink type of software system exists. However, most participants reported that the function had too great an impact on their office procedures, and only rarely used it.

5. To demonstrate to the practitioners and private sector hardware/software service providers, feasible and acceptable approaches to electronically submitting claims.

   This was clearly demonstrated during the Medilink project, and applied to large and small locations, to practitioners with existing sophisticated computer systems in place, and to practitioners with no previous exposure to computers. The project also provided valuable lessons for any future electronic submission implementations.

6. To allow the Department to define technical standards for direct communication to the Department's databases.

   - The market for computer hardware is so large that many alternatives could not be evaluated. Any hardware not already tested, and required to be used for Medilink, would have to be accredited before use.
   - The variety of geographic locations would have to be verified for telecommunications stability prior to installing Medilink province-wide.
   - A close appreciation of the areas of technical standards definition was gained, which can be used by the Department to establish comprehensive accreditation standards for electronic communication.

8.3 Refinements Required

This section identifies some of the areas identified for refinement in more detail:

1. Exception Claims
   The advantages of electronic submission are significantly reduced whenever claims must be submitted by non-electronic means. The Department should look at ways of reducing (if not eliminating) such claims, which include those for out-of-province patients and those requiring supporting documentation. The results of this would be benefits to both practitioners and the Department.

2. Patient Numbering
   A number of problems occurred during the pilot project which related to the patient registration number. While the resolution of these problems is not critical to the success of any future Medilink system, their reduction would contribute to the benefits to be gained. The main issue is the lack of a unique number. Changes to a number cause problems of tracking and keeping information current, and the requirement to maintain old numbers as well as current ones causes an excessive data storage and maintenance problem on the host mainframes.

3. Currency of Information
   While the claims processing system runs on a weekly basis, the information used for Medilink purposes will always be out of date, by as much as a week. This situation will not improve, with the possible exception of transmitting extract information electronically to the host mainframe(s), rather than by magnetic tape. This will shorten the time taken to update host mainframe databases, resulting in more current information.

4. Accuracy of Information
   The accuracy of the Department's data is obviously dependent on a number of factors. The accuracy of extract information used for eligibility checks, and name searches in particular, reduced the effectiveness of the function. While the resolution of these problems is not critical to the success of any future Medilink system, their reduction would contribute to the benefits to be gained, and the Medilink system itself could be used to improve the accuracy of patient information. It could be used to highlight problems, and to submit updates electronically to the Department, subject to Departmental security controls.

5. Accreditation

If one or more private vendor mainframes are to be used in any future Medilink configurations, then rigorous accreditation requirements must be defined in detail. The following areas were identified for consideration in establishing accreditation criteria:

5.1 Host Mainframe

The Department already has in place a number of accreditation requirements of service bureaux. These should be used as a starting point, and adapted as required.

5.2 Practitioner Data Integrity

It may be required that the mainframe vendor demonstrate that claims information submitted from a practitioner site is not changed, lost or added to prior to submission to the Department.

5.3 Extract Data Integrity

The Department should consider the controls surrounding the provision of extract information to mainframe vendors. This information has previously not been released by the Department.

5.4 Practitioner Authorization

The current practice for service bureau submission requires that the practitioner or designated signatory provides a signature to accompany each batch of claims submitted. With the advances in technology, such a requirement would seriously inhibit the benefits to be gained from electronic submission. The current policies would have to be reviewed by the Department.

6. Hardware

During the course of the pilot project, a number of hardware devices were used. They are listed elsewhere in this report, together with notes of any problems encountered, and recommendations for minimum configurations. However, the market for computer hardware is so large that many options could not be evaluated. Whatever course of action is taken, practitioners must be made aware of the limited investigation carried out by the pilot project, and some form of accreditation carried out on any new hardware to be used.

7. Software

There are many software systems on the market which address practitioner billing requirements, and the pilot project used only a few of these. The lesson learned was that practitioner requirements vary considerably, as do the facilities provided by software packages. It is possible that the Department includes in the accreditation process confirmation that any software package to be used meets minimum requirements such as the format of records being submitted to the Department, and minimum, published standards for editing. It could prove impossible, however, for the Department to go any further and recommend software packages in terms of functions provided, ease of use, cost, value etc. The practitioner community must be made aware of this.

The lessons learned during the pilot project should be made available to practitioners, to help them select the most appropriate system for their needs. Lessons learned about claim number assignment and access to payment information should either be made available to mainframe vendors, or built in to the accreditation procedures.

8. Telecommunications
Although the pilot project tested a variety of geographic locations, the number of sites participating was very limited. For example, problems were encountered with Datapac nodes at Red Deer and Lethbridge, and one Edmonton area exchange also caused problems which have not yet been resolved. It is not known to what extent this type of problem would impact a province-wide installation.

The pilot project utilized two commercial telecommunications networks. The implications of running multiple networks on some of the Medilink functions, some of which may be future considerations such as electronic mail between any practitioners, remain to be investigated.

9. Confidentiality
While a number of topics relating to security have been raised and discussed in this report, questions of confidentiality remain to be addressed. The extent of making available extract information available from the Department's databases needs to be refined.

10. Support
The amount of support required for a Medilink location varies due to location, communication type, and the type of business practice being carried out. When required, this support must be readily available to the practitioner, otherwise a negative impact will be felt on his business, in terms of manpower requirements and his finances.

All of these issues should not detract from the fact that Medilink clearly demonstrated a number of potential benefits to be gained by the practitioner, the Department, and the private sector.

Subject to policy issues being resolved, the opportunity exists for providers of hardware, software and computing services to provide practitioners with the choice to suit the wide variety of requirements. This would result in a viable alternative claims submission environment which is capable of expansion to take advantage of future developments in technology and telecommunications.